Medical Mythology: Its Etiology, Prevention, and Treatment

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Abstract. Myths are widely held beliefs that are false or of unverifiable existence. In medicine, they are not just unproven theories or mistaken conclusions but fictitious ideas that weave their way throughout the profession. To prevent and treat medical myths, they must be recognized as a disease harmful to patient care. Using established principles of medicine, the myths can be medically managed and a cure attempted. The prevention of myths is accomplished through evidence-based medicine and numeracy. The cure of a myth requires greater peer review of academics by practicing clinicians. Thought leaders must speak up despite professional isolation or public ridicule to turn the tide against a pervasive myth.

Introduction

Throughout the history of medicine, whenever new ideas are found, we have traditionally gone back to mythology. Much of our medical terminology, anatomy, and disease names originated in mythology, such as Achilles, Atlas, Narcissus, and Panic (from the God Pan). This may be secondary to man's discomfort with change, resulting in the immobilization of newer ideas by offering a feeling of security in tradition [1].

In medicine, myths are widely held beliefs that are false or of unverifiable existence [2]. They are more than just unproven theories or mistaken conclusions. Rather, medical myths are fictitious ideas that weave their way through the group psyche of our profession [3]. To both prevent and treat these myths, we need to recognize them as a disease and use our medical skills to treat and prevent them. First, we need to understand their etiology. Then we can then design ways to prevent and eradicate them systematically. In this article, we will define medical myths, explore their etiology, and propose methods to eradicate old myths and prevent new ones.

Medical myths are irrelevant standards of care that do not help a patient and occasionally cause harm. They become widely disseminated through lectures, opinion articles, and textbooks. Oral transmission of the myth by others is perhaps the most powerful vector.

The Case of Hormone Replacement Therapy

An example of a medical myth was the widespread use of hormone replacement therapy (HRT) in women to prevent coronary artery disease [4]. This practice started in the 1980s and flourished in the 1990s. It became a standard of care. HRT was metaphorically viewed as an elixir of life. Those who did not prescribe HRT were considered uninformed or bad doctors. Yet ultimately, this practice was proven to be bad medicine.

The story of HRT for the primary prevention of coronary artery disease highlights etiologies common in developing a myth. First of all, there was solid physiological evidence suggesting a cardioprotective effect [5, 6]. Secondly, there were significant biases in the research, e.g. one major study only looked at Caucasians [7], and another only members of a regional health maintenance organization [8]. This inappropriate extrapolation of physiologic evidence and biased research into

clinical medicine helped feed and nurture the myth.

Ultimately, a large, randomized clinical trial found that HRT was not indicated for the primary prevention of coronary artery disease or any other chronic disease [9]. Randomized clinical trials have subsequently refuted the conclusions from the earlier, biased observational studies that HRT was effective as a primary cardioprotective measure. These clinical trials reached a different conclusion partly because they evaluated confounding variables not examined in the earlier studies.

For example, although observational studies found a positive effect of HRT on coronary artery disease, a randomized clinical trial found that HRT was harmful [10]. Furthermore, when total mortality was evaluated, the overall risks of HRT outweighed any possible benefit [11].

Solutions

Medical myths are dangerous not only because of their inherent falseness (resulting in suboptimal medical care) but also because they are highly resilient and resistant to change. Myths become especially powerful when they involve life and death issues because this emotional component helps turn a myth into a widely distributed meme [12]. Memes, which circulate units of cultural information much in the same way genes pass on biological information [13], can become pathological when they propagate false ideas. The memes that transfer false ideas throughout our profession can act like thought viruses [14]. To provide the best possible care for our patients, we need to attack these thought viruses head-on. We start the process by understanding the etiology of a medical myth.

At its foundation, the etiology of a myth is an incorrect conclusion drawn from good data or a correct conclusion drawn from bad data. This faulty thinking results in the adoption of falsehood as truth. One example is when we adopt a hypothesis as true simply because it makes logical, pathophysiologic sense. Another example is when we blindly accept the teachings of a medical expert without examining the basis of their opinion or the adoption of a common practice that has not been objectively evaluated [15]. A third example is when a poor understanding of biostatistics leads to the misinterpretation of medical research. Putting logic ahead of the

scientific method, excessively relying upon expert opinion, and an incomplete understanding of biostatistics all contribute to the etiology of a medical myth. We need to address all of these core etiologies to eradicate and prevent myths.

The eradication of a medical myth needs to focus on the profession. Because a false medical theory only grows into a myth when it becomes widely adopted, its cure only occurs when the majority reject the false idea and replace it with the truth. To bring this about, the focus is on the small units, the memes of a larger myth. We come closer to the truth as these memes evolve, and the myth gradually dies.

This evolution of mythical memes in medicine is already solidly underway. Perhaps the best example is the Cochrane Collaboration, which has instituted a rigorous and systemic approach to evaluating the medical literature [16]. Furthermore, many medical organizations are doing away with blanket expert opinion consensus statements. Instead, guidelines are presented with a strength of evidence score, which helps acknowledge the deficiencies and gaps in our knowledge [17].

The Internet has also served to treat medical myths by allowing a faster and easier way for non-academic clinicians to peer-review journal articles. A good example of this process is journals which allow the online community to post “Rapid Responses” to their articles [18]. Typically, they publish just about anything that isn't libelous or doesn't breach patient confidentiality, and based on a large number of contributors, the response from the online community has been overwhelmingly positive. “Rapid responders,” as they are called, note significant benefits, including online peer review and greater attention to the original article. It has even been suggested that research articles should be posted anonymously on the journal website before publication to incorporate an online peer review in addition to the traditional “expert” peer review [19].

Treating established medical myths, however, will never be fully effective unless strong measures are taken to prevent myths in the first place. Preventing bad data from getting into the medical literature is a primary goal. One way to do this is to minimize the link between the pharmaceutical industry and medical researchers [20]. Having the authors state any conflicts of

interest at the end of the article is insufficient because it is clear that capitalistic interests and monetary profit can affect what research is published and how it is presented. In addition to authors' conflict of interest disclosures, journal editors and reviewers also need to disclose their own conflicts. The conflicts do not exist only among authors but also among journal editors and reviewers. These additional conflicts must be disclosed because of their large impact on what ultimately gets published [21]. Journals also need a quality control system to ensure against statistical abuse, which frequently occurs [22], especially when conflicts of interest come into play.

The prevention of a myth also requires us to interpret good data correctly. Unfortunately, the medical profession continues to be plagued by innumeracy. For example, internal medicine residents have a worrisome knowledge deficit concerning biostatistics [23]. This is not a new finding but a long-standing problem that remains unaddressed [24-26]. One study of Danish doctors even concluded that “the statistical knowledge of most doctors is so limited that they cannot be expected to draw the right conclusions from those statistical analyses which are found in papers in medical journals” [27]. While innumeracy pervades society as a whole [28], we must not allow it to be rampant in the medical community. All medical professionals must have at least a basic understanding of how to interpret biostatistics and understand research methodology. The failure of medical schools and continuing medical education programs in teaching statistics must be corrected. One suggestion to help the situation is to require statistical training as a prerequisite to medical school [29].

Conclusion

Although measures are underway to treat and prevent medical myths, there continues to be a problem. Medical mythology, the disease, continues to thrive. Implementing evidence-based medicine is a positive step by reducing our tendency to rely solely on opinions and biased studies rather than observation and the scientific method. Having practice guidelines incorporate “weight of evidence” scores has also helped decrease the negative effects of expert opinion. However, there remains a suboptimal understanding of biostatistics and research methodology by medical professionals. This problem requires an aggressive approach.

Medical mythology is a robust and resilient virus. We need to be diligent in our efforts to eradicate this insidious disease.

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